

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
7 April 2005 (07.04.2005)

PCT

(10) International Publication Number  
**WO 2005/031392 A3**

(51) International Patent Classification<sup>7</sup>: **G02B 6/26, 6/42**

(74) Agent: **FRIEDMAN, Mark**; 7 Jabotinsky St., 52520 Ramat Gan (IL).

(21) International Application Number:

PCT/IL2004/000884

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date:

22 September 2004 (22.09.2004)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

60/505,870 26 September 2003 (26.09.2003) US

(71) Applicant (*for all designated States except US*): **RAMOT AT TEL-AVIV UNIVERSITY LTD.** [IL/IL]; P.O.Box 39296, 32 Haim Levanon St., 61392 Tel Aviv (IL).

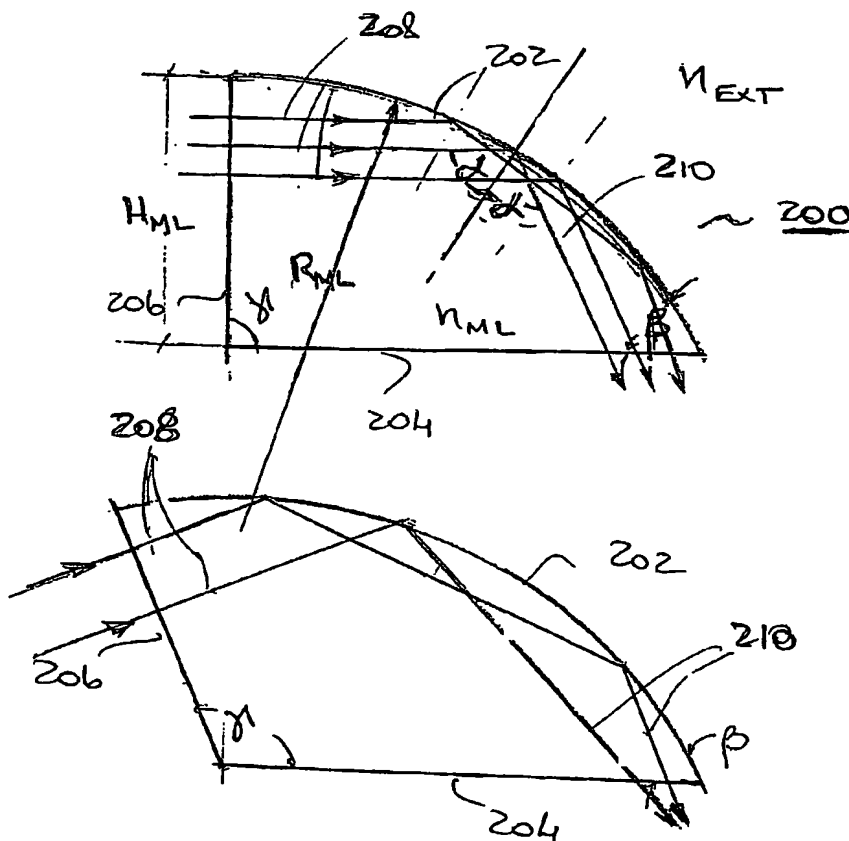
(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,

(72) Inventor; and

(75) Inventor/Applicant (*for US only*): **NATHAN, Menachem** [IL/IL]; Arueh Suslik 5, 69359 Tel Aviv (IL).

[Continued on next page]

(54) Title: **INTEGRATED MICROLENS REFLECTOR AND LIGHT COUPLER**



(57) Abstract: A microlens reflector (200) and light coupler comprises a material transparent to light of a predetermined wavelength bound by an envelope with a curved section (202) and at least two non-parallel flat sections (204, 206), the curved section (202) operative to reflect internally light entering the component through one flat section (206), the reflected light directed to leave the component through its other flat section (204). The microlens reflector can reflect and couple light from one optical element into another optical element, e.g. from a waveguide into a detector, and from a light source into a waveguide. Arrays of integrated microlens reflectors (700) may be used to couple optical fibers to on-chip optical waveguides in NxM optical cross-connects and switches, providing simple, true 3-dimensional optical coupling architectures.



SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

**(88) Date of publication of the international search report:**

4 August 2005